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(54) IMPROVEMENTS IN OR RELATING TO DETENT MECHANISMS FOR ROTARY SWITCHES

(71) We, SIEMENS AKTIENGESELLSCHAFT, a German Company of Berlin and Munich, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to detent mechanisms for rotary switches.

Rotary switches require detent mechanisms in order that they can be stoppd with sufficient accuracy at the individual switch positions. It is important in this connection that the mechanical detent locations of the switch should correspond as accurately as possible with the related electrical switch positions. Detent mechanisms are generally classified as being either radial or axial in design, according to whether the detent elements are disposed at right-angles to the switch spindle or are displaceable in the direction of the spindle axis. Because of their more compact design, radial detent mechanisms are preferred for miniature rotary switches. Frequently, in such cases, a section of the switch spindle is provided having an enlarged diameter, and containing a bore disposed at right-angles to the spindle and symmetrically with respect thereto. Into the openings of the bore, balls are inserted which are forced outwardly by a helical spring located between them into contact with a detent track. The detent track is provided with depressions into which the balls engage as soon as the switch reaches a switch position. The proper operation of this kind of detent mechanism assumes that the bore is disposed symmetrically to the spindle with high accuracy. Errors in symmetry lead to a so-called double detent effect. In this case, only one of the two balls used as detent elements is forced into a detent track depression corresponding to a switch position, whilst the other ball, because of the offsetting of the bore caused by the assymetry, cannot engage fully in its own depression. It is only after a slight further rotation of the switch that the other ball can engage. Thus, each electrical switch position has in fact two mutually different detent positions which moreover do not correspond precisely with the electrical switch position. The production of exactly symmetrical spindle bores for radial detent mechanisms is, however, a relatively elaborate operation in particular where mass production of these mechanisms is concerned.

It is an object of the present invention, therefore, to provide a detent mechanism which can be produced economically by mass production, and which makes it possible to retain the advantages of a detent mechanism with detent elements guided in a guide passage symmetrical with and at right-angles to the spindle, but which does not require the production of an expensive bore in the spindle.

According to the invention, there is provided a detent mechanism for a rotary switch comprising a plurality of detent elements in radially disposed guide passages formed in a detent element cage rotatable with the switch spindle, and elements being biased into contact with a stationary detent track surrounding the cage, wherein said cage is in the form of a generally cylindrical body, and wherein said guide passages are formed by a groove formed in one end face of said cage, said groove being disposed at right-angles to the axis of the switch spindle and symmetrically with respect thereto, and said groove being closed off by a plate. The detent element cage may be in the form of a zinc or zinc alloy die casting, or of a sintered body. If desired, grooves forming guide passages may be formed in both faces of the cage, each groove being closed off by a respective plate.

[*Price 33p*]

The invention takes cognisance of the fact that by designing the detent element cage as a zinc die casting or sintered component with a groove formed in its end face at right-angles to and symmetrical with the spindle, in the manufacture of the mould required for the production of this component, a relatively high outlay can be borne in order to accurately dimension and adjust the mould parts required to produce the groove without making the manufacture of a detent element cage appreciably more complicated.

In accordance with a further feature of the invention, the detent element cage may be designed to slide onto the switch spindle, the switch spindle in this case being provided with a transverse bore which interconnects the parts of the groove interrupted by the spindle. The groove is closed off by an annular disc which can be fixed onto the switch spindle. Alternatively, the detent element cage can be attached to the switch spindle as an extension thereof, and the groove closed off at its end by means of a metal plate that can be clamped in a correspondingly shaped recess formed in one end of the cage. The detent mechanism of the present invention makes it possible to use rollers as detent elements; these produce a substantially smaller specific pressure than that produced by balls operating in a bore, so that it is possible to use synthetic resin material or a zinc alloy for the detent housing containing the detent track.

The invention will now be further described with reference to the drawings, in which:—

Figure 1 is a side-sectional view of a first exemplary form of detent mechanism according to the invention;

Figure 2 is a section taken along the line II-II of Figure 1;

Figure 3 is a side-sectional view of a second exemplary form of detent mechanism according to the invention;

Figure 4 is an end view of the detent element cage of the detent mechanism of Figure 3; and

Figure 5 is a side view of the cage of Figure 4, partly in section.

Referring to Figure 1, a detent mechanism comprises a substantially hollow cylindrical housing 1 which is traversed coaxially by a switch spindle 2. Inside the detent mechanism housing 1 and slidable on the switch spindle, there is arranged a generally cylindrical detent element cage 3. In one end face 4 of the cage 3 (which is in the form of a zinc die coating or of a sintered body), there is provided at the time of its manufacture a groove 5 disposed at right-angles to and symmetrical with the switch spindle 2, the groove being closed off by a disc 6 fixed on the spindle 2 in order to form a detent element guide passage which is thus open only at the peripheral ends. The switch spindle is provided with a bore 7 which links together the sections 8 and 9 of the groove 5 which are separated from one another by the spindle 2. Into the peripheral openings of the groove, rollers 10 are introduced to act as detent elements. The detent elements are forced by a helical spring 11 arranged between the rollers 10 in the guide passage 5 into contact with a detent track 12 (see Figure 2), formed in the internal wall of the housing 1. The detent track 12 contains depressions 13 into which the detent elements 10 can engage and which correspond with the individual positions of the rotary switch. In this detent mechanism, the detent elements 10 are arranged in a guide passage disposed precisely at right-angles to and symmetrically with the spindle 2, because the groove 5 used to guide the detent elements has been produced in the cage 3 at the time of manufacture thereof, and the mould used to manufacture the cage has been produced with very great accuracy. The bore 7 linking the two groove sections 9, 10, on the other hand, does not have to be precisely symmetrical with regard to the spindle, because it simply accommodates a central section of the helical spring 11 and performs no guiding function as regards the detent elements 10.

In the detent mechanism shown in Figure 3, the detent element cage is so designed that it forms an extension of a rotary switch spindle which has not been shown, and can be attached thereto, for example by a flange 20. Again, in this detent mechanism, the detent element cage 3 has a groove 5 disposed in and open towards an end face 16 disposed away from the operating end 15, the groove 5 being produced at the time of manufacture of the cage and extending transversely of and symmetrically to its axis. The groove 5 forms a guide passage for detent elements 10 and houses a helical spring which forces these elements outwards. The detent element shown in Figure 3 is distinguished essentially from that shown in Figure 1, by the fact that in this case the groove is closed off at the end face by a metal plate 19 housed in a recess 17 in the end face 16 of the cage 3 by appropriate setting of lugs 18, as shown more clearly in Figures 4 and 5.

WHAT WE CLAIM IS:—

1. A detent mechanism for a rotary switch comprising a plurality of detent elements arranged in radially disposed guide passages formed in a detent element cage rotatable with the switch spindle, said elements being biased into contact with a stationary detent track surrounding the cage, wherein said cage is in the form of a generally cylindrical

body, and wherein said guide passages are formed by a groove formed in one end face of said cage, said groove being disposed at right-angles to the axis of the switch spindle and symmetrically with respect thereto, and said groove being closed off by a plate.

2. A detent mechanism as claimed in Claim 1, wherein said cage is formed by a zinc or zinc alloy die casting.

3. A detent mechanism as claimed in Claim 1, wherein said cage is formed as a sintered body.

4. A detent mechanism as claimed in any one of Claims 1 to 3, wherein said cage is adapted to slide on to the switch spindle, said spindle being provided with a transverse bore which interconnects the sections of the groove interrupted by the spindle.

5. A detent mechanism as claimed in Claim 4, wherein said groove is closed off at the end face by an annular disc adapted to be fixed on the switch spindle.

6. A detent mechanism as claimed in any one of Claims 1 to 3, wherein said cage is attached to the switch spindle as an axial extension thereof, and wherein said groove is closed off at the end face of the cage by means of a metal plate clamped in a correspondingly shaped recess formed in said end face.

7. A detent mechanism as claimed in any one of the preceding Claims, wherein said detent elements are in the form of rollers.

8. A detent mechanism for a rotary switch, substantially as hereinbefore described, with reference to and as shown in Figures 1 and 2, or Figures 3, 4 and 5 of the drawings.

9. A rotary switch including a detent mechanism as claimed in any one of the preceding Claims.

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig.1

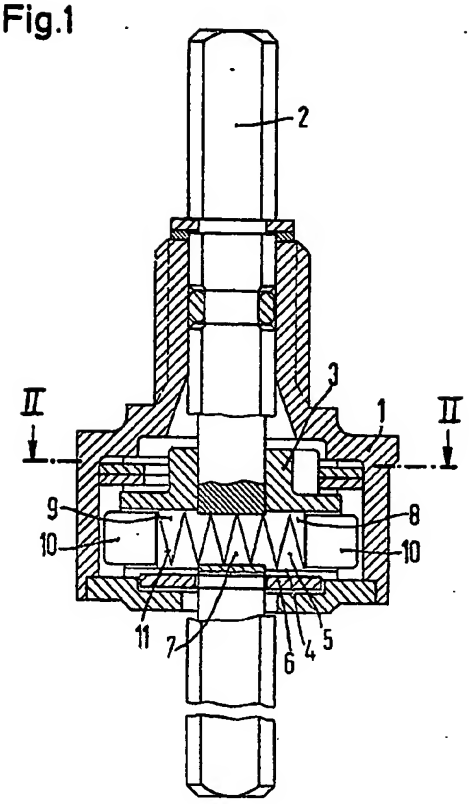

Fig.2

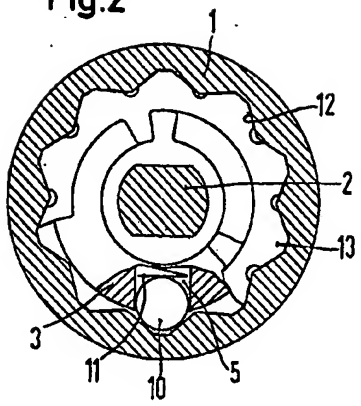

Fig.3

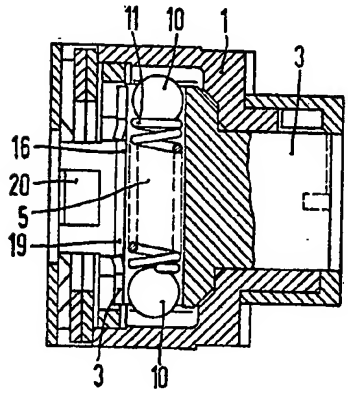

Fig.4

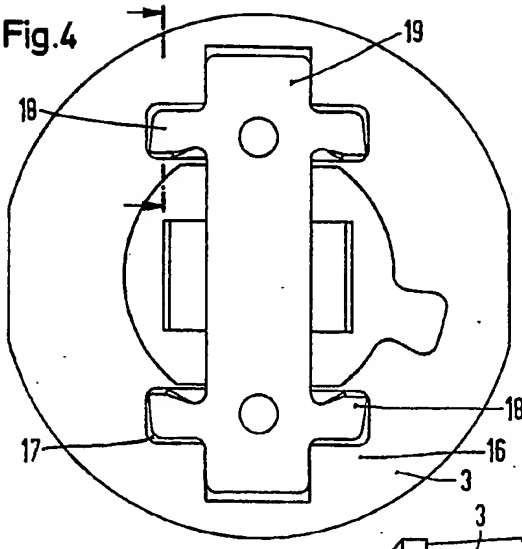

Fig.5